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ABSTRACT

The National Environmental Data Referral Service (NEDRES) is being developed in response to a national need to improve the awareness of and access to a broad range of environmental data files. Two studies were conducted in support of this effort: a survey of prospective users confirming the need for and willingness to pay fees for the service and a review of the organizational characteristics of five existing information service networks. This report builds on the two previous studies in the direction of the evaluation of organizational features and the generation of configurational options that might be most suitable for the NEDRES network. Included is a review of some selected theoretical concepts from economics and some models of organizational arrangements prominent in the information service area. The analysis of reference systems and evaluation of optimal configurations were structured by attending to nine functional areas: structure/governance procedures; communication patterns/methods; legal agreements; policies for financial support; user charges and cost recovery; operating procedures; publicity and user education/training; performance measures; and benefits of network participation. The analysis resulted in recommendation of a hybrid arrangement between centralized and decentralized approaches. Salient features of this hybrid arrangement are discussed. (JN)

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Descriptive Analysis of Selected Data Referral Networks

Submitted to:

United States Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Science Information Center
Rockville, Maryland

Submitted by:

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June 25, 1982

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Table of Contents

Page

EXECUTIVE SUMMARY.....1

1.0 Introduction.....3

1.1 General Selection Criteria.....4

1.2 Supplementary Considerations.....7

2.0 Synoptic Descriptions of Candidate Prototypes.....9

2.1 USGS - NAWDEX (WATSTORE).....11

2.2 NLM - RML NETWORK/MEDLINE.....18

2.3 Social Science Data Archives Network.....23

2.4 The On Line Computer Library (OCLC, Inc.).....29

2.5 GEOSCAN - The Canadian National Database for Geological Information.....35

2.6 Incidental Observations.....39

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EXECUTIVE SUMMARY

The Environmental Data and Information Service (EDIS) of the National Oceanic and Atmospheric Administration is currently planning the development of a National Environmental Data Referral Service (NEDRES) in response to a national need to improve the awareness of and access to a broad range of environmental data files. The MAXIMA Corporation is currently supporting the system planning and development activities of EDIS. Specifically, MAXIMA has been requested to review current data referral networks, select a number that have characteristics relevant to the NEDRES systems concept, study the selected networks, prepare a report describing the selected networks using nine topical categories provided by EDIS, outline two recommended networks, and prepare a written and oral report on our recommendations. This report fulfills the first part of our task, a description of selected existing data referral networks.

MAXIMA began its network selection process by conducting a bibliographic search over a period of five years of relevant literature. Generally, as networks were defined as possible candidates for review and inclusion in this report, telephone interviews were held with individuals knowledgeable about the network and its operation. If the discussion indicated that the network was promising, a personal interview was held to obtain detailed information.

There were four generic criteria used as guides to selecting prototype systems from which lessons can be learned to guide the planning of NEDRES. They are:

- The nature of the information source
- The primary mode of service
- The basic structure
- The economics of the confederation.

Supplemental considerations used in screening candidates for prototype status included:

- o Distribution of holdings
- o Methods of data transfer
- o Manual or computerized search tool
- o Role of holders as users, and vice versa
- o Manner of communication in the network
- o Details of fee arrangements.

Our review indicated that for other than the basic structure criterion, NEDRES is not well precedented in the sense that there are not large numbers of well matched predecessor systems. However, we found systems that share some important features with NEDRES and showed considerable promise for insights into the NEDRES planning process.

The five systems selected as a result of this process and discussed in detail in this report are:

- o United States Geological Survey - NAWDEX
- o National Institutes of Health - NLM - RLM NETWORK/MEDLINE
- o Social Science Data Archives Network
- o On Line Computer Library Center, Inc. (OCLC)
- o GEOSCAN (Canadian Index to Geoscience Data)

Each of these network discussions will contribute information and experiences into the process of recommending network design to EDIS. In addition, the information MAXIMA staff obtained during the research and review of other networks will assist in the successful completion of planning the NEDRES system.

NEDRES DEVELOPMENT SUPPORT PROJECT
PHASE II - TASK A
TECHNICAL REPORT

IDENTIFICATION AND SELECTION OF PROTOTYPE INFORMATION REFERRAL NETWORKS

1.0 Introduction

As is the case with most sophisticated information systems, the National Environmental Data Referral Service (NEDRES) can be perceived in different ways from different perspectives. For present purposes, the appropriate focus is on the managerial function which can be characterized as the "governance of a user/provider confederation."

Relevant to that selected perspective, as a general background condition, is the basic role of NEDRES as a linking device between holders of information resources in the form of numerical data files (NDFs) and prospective users of such resources. It is anticipated that any particular set of such links between holders and users will be transitory or intermittent with respect to the transfer of the actual resources. However, there are additional kinds and levels of transaction--among holders, among users, and between holders and users--that should also be facilitated. Consequently, part of the NEDRES plan calls for the establishment of a form of voluntary confederation of participants that will serve to encourage and enhance such "supplementary transactions" (i.e., those communications above and beyond what is intrinsic to requests for NDFs and delivery of NDFs).

As a step toward refining and particularizing the planning concept, a review of the experiences gained from the operation of similar systems has been initiated. The specific purpose of this report is to describe the progress in the direction of identifying, selecting, and describing such predecessor systems.

1.1 General Selection Criteria

Many collaborative arrangements exist among organizations that provide information services. However, all such arrangements are different in degree if not in kind from what is being planned for the NEDRES. Fundamentally, the vast majority of such arrangements involve organizations that deal in document-related services. The functional focus of most such collaborative arrangements is usually to be found among one of the following:

- o Shared responsibility of document cataloging, classification, or indexing
- o Shared utilization of computerized bibliographic files
- o Document delivery.

In contrast to the emphasis on document-related services, the primary service to be provided by NEDRES will be reference and referral to numerical data files--mainly in computer-readable form.

Because of the historical pattern of selective attention to documents as resource, the construction of a list of prototypical models involves some serious trade-offs. The richest reservoir of experience relates to confederations that are likely to have properties different from those conceived for NEDRES.

Specifically, for example, the most massive cooperative entities in the information field are those engaged in the mutual provision of cataloging and classification services such as the On Line Computer Library Center, Inc. (OCLC, Inc.). While cataloging (and indexing) are important developmental activities for NEDRES, this component of the work of the collective is likely to be more centralized in the NEDRES plan of operation.

Indeed, as indicated above, the major service mode for NEDRES will be the holder-user linking function: a reference and referral function in conventional terms. Unfortunately, referral, as such, has become a relatively neglected area in the total set of information services. Where it is found, it is likely to be a minor component in a larger set of reference and bibliographic support activities. Thus, for present purposes, there must be accept-

ance of the constraint that most of the systems nominated as prototypes for NEDRES will exhibit a relatively low level of effort in the referral service mode and that consequently, some of the lessons to be learned from such prior experiences will need to be extrapolated across rather large conceptual distances.

The third factor that can be brought to bear on the selection of prospective partial models for NEDRES is that of organizational structure. The attributes to which attention should be given include such factors as the kinds of organizations or institutions that are involved, how many there are, how they are distributed geographically, and what was the nature of their interrelationships prior to the assembly of a more-or-less formal confederation for information transfer.

In this matter, we should be looking for situations in which a government agency, for example, is designated to play the central role as manager of the confederation. Similarly, we should be looking for a participant composition that is a heterogeneous mixture of large and small, public and private, profit and not for-profit--across a broad range of activity sectors from agriculture to public utility operations. Finally, we want an initial array that includes some distribution across international boundaries.

While this general criterion is complex in the sense that it contains many subordinate factors, it is relatively easy to fulfill. Many ongoing information transfer confederations have the requisite features.

The final criterion is simpler yet more difficult to fulfill. The focal issue is that of the economics of the confederation. The essential question is: Who pays when for what? The exact answer to this question for NEDRES is still open. The present plan, for example, calls for the provision of the catalog to prospective users in both a print-on-paper and a computer-readable version. The print-on-paper version presumably would be sold and NEDRES would receive a royalty from each such sale. Likewise, the computer-readable version is to be made available via one or more of the commercial on-line search services where, again, royalties would ordinarily be forthcoming. What is uncertain is whether holders who might charge users a fee would share that revenue with NEDRES. Even more central to present concerns is whether or not

there would be "dues" for membership in the confederation. The present plan intimates that membership in the confederation will be voluntary but ambiguities remain about what privileges and prerogatives will be tied in to membership status.

Most large-scale information transfer consortia operate on a subscription basis; that is, all services are contingent upon becoming an official member and there is an initial membership fee plus annual dues. Even some of the most prominent government-based services are so set up (e.g., MEDLINE). Others depend on unit transaction fees (e.g., NTIS, the RML Network). Still others engage in some form of explicit cost sharing (USCB-GBF/DIME). In any case, the question of economic arrangements is central to the future management of NEDRES and if relevant experiences have been acquired by other systems, the resultant lessons will be valuable inputs into the NEDRES developmental process.

In summary, there are four generic criteria put forth as guides to selecting prototype systems from which lessons can be learned to guide the advanced planning of NEDRES in the area of structuring and managing a confederation arrangement among participants. These are, in brief:

- The nature of the information resource
- The primary mode of service
- The basic structure (including the nature of the prospective participants)
- The economics of the confederation.

For all but the basic structure criterion, NEDRES is not well precedented in the sense that there are not large numbers of well-matched predecessor systems. Some extrapolation will be necessary. However, as we shall see, there are a number of extant systems that share some features with NEDRES and that show considerable promise as fruitful sources of prescriptive insights.

1.2 Supplementary Considerations

The generic criteria described above are primarily for the basic screening of candidates for prototype status. Once selected, even tentatively, as a potential source of relevant experience that can be used in furthering the design of NEDRES and for yielding lessons for the management of the NEDRES confederation of participants, other features of the prototype system will need to be taken into consideration for purposes of comparative analysis.

One such feature is the form of the distribution of holdings, specifically, some extant data services are based on either a singular central repository or a small, coherent set of such repositories. In such instances, it is logical for the repository manager to be, in effect, the overall system manager. Even when copies of the raw data files are made available to users from local service nodes (as is the case for census data, for example), the unitary character of the basic resource appears to militate in favor of the initial producer/holder playing the managerial role. With respect to NEDRES, quite a different situation will prevail. While other components of NOAA will be significant holders of data resources, NEDRES, as such, will "own" no data of its own. In fact, substantial holdings will be held outside NOAA and, indeed, outside the Federal Government. In short, NEDRES will be concerned with data holdings that are widely diffused.

There could be both advantages and disadvantages associated with such an arrangement. For example, as a non-holder, the aura of the "honest broker" with no special interest to pursue should be easier to generate. On the other hand, with many dispersed holders, the cost of the bare essentials in liaison (e.g., updating file descriptions) can be far from trivial. The point is that in order to interpret whatever lessons are forthcoming from the experiences of the prototype systems, this feature must be kept in mind.

Much the same can be said about the alternative methods of the data transfer. Most data transfer is now accomplished by the physical transport of copies of the data files on magnetic tape because this option is cheaper than the direct electronic mode. However, the direct mode is faster and the cost is progressively coming down. It is not unlikely that some transactions between holder and user that are mediated by NEDRES will utilize direct elec-

tronic transmission since at least some pairs of participants will be mutual engagies in ARPANET, the main system in current use that permits large-scale data transmission between subscribers. If many such links get exercised via ARPANET, it could bring into question the whole mediational function of NEDRES (i.e., why not cut out the middle man?"). The point is that contrasting experiences in both mediated and direct transfer arrangements should be valuable in structuring the NEDRES confederation.

If the process of data transfer is mediated, a critical reason for sustaining that role would be that arrangements for access and data transport are ordinarily complex and fraught with impairments. If the mediator can, for instance, cut through the red tape, then the mediator role retains its value even if the end result is direct electronic transmission of the resource from holder to user or direct data manipulation by the user using the holder's computer by remote, real-time control.

Another issue, that of whether the search tool is manual or computerized, is well understood and requires little elaboration here. Suffice it to restate that the NEDRES operation is likely to employ both means.

Another supplementary feature relates to the basic structure criterion as set out above. Specifically, the concern is directed toward whether or not holders will also be users from time to time and vice versa or whether these roles in the structure are mostly distinctive. We can anticipate that the work of the NEDRES will be somewhat easier if the role of participants shifts back and forth. Such shifting will help remind participants of one another's shared problems. Otherwise, the contrasting interests of those organizations in one predominant role might tend to coalesce into a kind of factionalism.

Similarly, it will be important to determine whether or not any subgroupings of prospective participants in NEDRES have any prior formal or informal coalitional agreements. From a positive point of view, any already existing coalitional arrangements could be used as building-blocks in the formation of the NEDRES confederation.

Another interesting supplementary feature is the manner by which communications other than those directly concerned with the transmission of the NDFs proper are handled. Such matters as access procedures, contact points, eligi-

bility rules, and fees levied by holders or users would be major topics for such communication. The content of most relevance to the matter of confederation governance, however, could be in the nature of performance feedback--particularly commentary by users regarding the relative ease of access and, most particularly, instances of errors in the actual NDFs in the form of omissions, incorrect numerical values, or inadequate documentation (e.g., poorly defined field specifications).

This latter point leads directly to the question of who is responsible (in the NEDRES of the future) for ensuring the quality of the data. Should it be only the holder (with the warning, caveat emptor, transmitted to all users)? Or should NEDRES act as co-guarantor? Or will the very existence of a confederation that contains users tend to push NEDRES into some role related to data quality assurance?

Finally, related to the economics criterion, the details of fee arrangements must be clarified. The relevance of the feature is clear and it is noted here simply as a reminder of its importance in the process of drawing lessons from the experiences acquired in the operation of the prototype systems.

2.0 Synoptic Descriptions of Candidate Prototypes

There follows structured descriptions of five existing or historical confederations that have been chosen using the criteria and other considerations described above. Some compromises have been made and the extrapolation problem does appear but it is also apparent from the preliminary analysis that the strategy of extracting guidance from the lessons learned in the successes and failures experienced by such predecessor systems should be a valid one.

Each of the five networks is described using the following discussion areas:

- Structure and governance
- Communication patterns/methods
- Legal or operating agreements

- Policies and methods regarding financial support
- User charges and cost recovery
- Operating procedures
- Publicity, marketing, and user education/training methods
- Performance measures
- Benefits of network participant.

The selection of the various networks was preceded by a search of the literature and discussions with various agencies. A bibliographic search, covering the past five years, was made of the following:

- Library and Information Science Abstracts
- ERIC
- Social Science Citation Index
- Psychological Abstracts.

Agencies contacted to discuss network attributes and characteristics included:

- National Bureau of Standards
- Bureau of the Census
- Geological Survey
- National Institutes of Health
- Department of Energy
- Library of Congress
- Johns Hopkins Applied Physics Laboratory
- Geological Survey of Canada.

Systems that were reviewed and considered for their relevance to NEDRES included:

- NAWDEX
- NLM-RLM Network/Medline
- Social Science Data Archives Network

- o On Line Computer Library Center, Inc.
- o UNEP
- o Census DIME System
- o AGRIS and INIS
- o ARPANET
- o GEOSCAN (Canadian)
- o Library Users Consortium
- o Energy Data Base
- o Scientific and Technical Referral Service of the Library of Congress.

2.1 USGS - NAWDEX (WATSTORE)

2.1.1 General. Perhaps the best model for NEDRES is the National Water Data Exchange (NAWDEX) established by the United States Geological Survey (USGS) in 1976. NAWDEX serves as a national program for cataloging and indexing water data that are available throughout the nation. It provides the water-user community with easy and reliable access to water data using a volunteer membership structure working through a nationwide network of assistance centers. NAWDEX provides a structure for the users to assume responsibility for the cost of using the system and appears to have an effective mechanism to communicate with its users. It is a program that continues to expand in its data resources and service capabilities. It has accomplished with a single data source (water) what NEDRES is intended to accomplish with its more varied types of data bases.

2.1.2 Structure and Governance. A central program office, located at the USGS's National Center in Reston, Virginia, was established to provide overall management of the NAWDEX program, develop data-exchange guidelines, develop and maintain central indexes of available data, develop and maintain systems and software needed for the operation of the program, and coordinate a nationwide program of user services. Through the leadership of the program office, NAWDEX has been developed as a confederation of organizations working together to improve access to water data. Any organization may become a member of NAWDEX simply by indicating a desire to join. Membership requires a signed Memorandum of Understanding between the organization and NAWDEX. This docu-

ment defines the member's general commitment to participate in the program, provides a description of its own water data, and establishes an agreement to release such data in response to requests through the NAWDEX system. NAWDEX has established a nationwide network of assistance centers to aid the exchange of data between data holders and users. Currently, 60 centers have been established in 45 states and Puerto Rico. These centers provide users with assistance in identifying and/or locating needed data, or refer them to organizations where the data are held. The regional centers provide users with local and immediate access to the services, information, and data available through NAWDEX.

2.1.3 Communication Patterns/Methods. The NAWDEX program office is responsible for the pattern of communications covering the content and operation of the network. Once an organization agrees to participate in NAWDEX, an extensive manual on the administration and operation of the system is provided. Changes to the manual are simple since it is entirely contained in loose-leaf notebooks. A regular newsletter also is used to provide members with information on changes, new data availability, new members, program objectives, training sessions, staff changes, etc. In addition, membership meetings are held at roughly 18-month intervals. These conferences provide an opportunity to exchange views and discuss mutual problems through the presentation of papers and workshops. These conferences provide an excellent communications vehicle for NAWDEX and the users and providers of data.

2.1.4 Legal or Operating Agreements. Organizations are requested to sign two memoranda when they apply for membership in NAWDEX. The first is a Memorandum of Understanding which recognizes the new member as a participating member in NAWDEX and clearly lists the responsibilities of both the NAWDEX Program Office and the new member. The second document is a Memorandum of Agreement between both parties in the use of the data facilities of NAWDEX and the National Water Data Storage and Retrieval Systems (WATSTORE). These documents are binding on both parties unless formally terminated by mutual agreement by either party providing 60 days written notice to the other organization.

2.1.5 Policies and Methods Regarding Financial Support. The United States Geological Survey provides the NAWDEX Program Office with a budget to run, maintain, and improve the NAWDEX system. Approximately one third of their budget is spent for staff to accomplish this.

There is a wide, diverse group of organizations (public, academic, and private) providing data and services in the NAWDEX system. These groups have different policies and procedures regarding user costs. To provide the membership with a uniform and equitable system of charging, NAWDEX has provided the following guidelines:

- "Providing data and information is a proper 'service function' of government and research institutions, and water data and related services should be made available at the lowest cost possible to the user.
- User charges assessed by NAWDEX members should cover only those costs directly incurred by responding to the requests for data.
- As a general rule, user charges should not include personnel time of permanent staff, overhead costs, equipment amortization, or other fixed costs for services and products made uniformly available to all NAWDEX users.
- Special attention should be given to assessing charges for government, nonprofit, and academic users.
- Billing procedures for data and services should be simple and low-cost so as not to increase user charges."

These guidelines do not mandate specific procedures for use, rather, they are presented as objectives to be considered by members in developing user charges.

The charges for USGS are determined following the directives of Circular Number A-25 as issued by the Office of Management and Budget.

The USGS, through legislation, has the authority to collect the money charges for using NAWDEX and return it to the program. Many agencies do not have this authority, and charges to user, rather than returning to the program, are returned to the Federal Government's general fund.

2.1.6 User Charges and Cost Recovery. There are a number of items considered to be the types for which valid charges may be used in determining costs associated with responding to a request. Listed below, as shown in the NAWDEX guidelines for charges, are these items:

- Personnel: In general, charges should be considered only for personnel directly involved in responding to a specific request for data or services. Personnel charges should not be considered for products and services made uniformly available to all NAWDEX users. Personnel charges may include direct salaries and the cost of employee benefits proportionate to the time spent responding to a request.

- Material Provided: Charges may be considered for the actual cost of materials which must be provided in response to a request. Examples of such materials would be magnetic tapes, notebook binders, special containers, punch cards, and other items which must be purchased by the responding organization in order to satisfy a request.
- Duplication Costs: The cost of duplication of printed material may be computed at the actual cost of duplication per page or other unit. This includes the cost of photocopy, offset printing, and reproduction from microfilm or microfiche. The duplication of data in machine-readable form may be covered as computer costs, which are discussed later, unless the duplication is performed on peripheral hardware that is not included in the organization's standard computer charges and reimbursements must be made for its use. This includes punch-card duplicators, offline plotters, and printers.

- Computer-Related Costs: Charges may be considered for all computer costs associated with the retrieval, processing, and analysis of data or information associated with a request. This includes costs associated with use of the central processing unit, input/output transactions, core (memory) charges, connect time, and the use of peripheral equipment such as plotters, card punches, and microform equipment. If computer costs are computed on a variable scale based upon the priority of use of the computer, the requestor should be made aware

of this in order to assure that the required product or service is provided at the minimum cost.

- o Telecommunication Charges: Charges may be considered for telecommunication costs directly associated with responding to a request. This includes line (telephone) charges resulting from the remote use of computers and the transmission of data by facsimile or other types of transmission equipment.

- o Cost Incurred from Other Sources: Charges may be applied for costs assessed to the responding organization by other sources in the course of responding to a request. This includes computer costs charged by other sources, service fees paid to another organization, the cost of publications acquired from other sources, and any other action that results in a direct assessment to the responding organization.

- o Mailing Costs: Mailing costs other than normal postage may be considered. This includes air freight, special-handling fees, and courier services.

The actual determination of costs is a difficult, complex process. The concept of minimum cost and fairness to all requestors of data is urged to all providers of data.

The NAWDEX Program Office collects money for data and services provided by the USGS and through a special agreement, the U.S. Environmental Protection Agency's STORET system. All other providers of data collect directly from the requestor. NAWDEX does not bill for charges less than $15, having determined that the administrative cost of preparing an invoice, mailing, and processing the reimbursement is greater than the receipt itself. There are two surcharges applied to requests. The USGS Computer Center applies a 5 1/2 percent surcharge on computer use while NAWDEX applies a 15 1/2 percent surcharge.

There are guidelines for the suspension of charges to various categories of users. In addition to the less than $15 charge discussed above, it in-

cludes certain situations with state, local government, or nonprofit organizations, foreign or international organizations, reciprocal agreements, and situations where it is deemed to be in the best interest of government not to charge.

2.1.7 Operating Procedures. Upon becoming a member of NAWDEX, each organization is requested to designate one or more representatives to NAWDEX. This representative becomes the focal point for all contract or correspondence between the member organization and NAWDEX. The representative immediately receives five large notebooks which comprise the NAWDEX system manual. Volume 1 is an administrative manual giving guidelines, location of centers, how to operate, information on members, etc. Volumes 2-5 contain information on the system, how to retrieve, etc. Changes to the five-volume set are simple since the entire manual is loose-leaf.

Information and help on the system is available at the assistance centers located throughout the country. The consistency of assistance at these centers varies, however, since NAWDEX does not control the assignment of staff at the centers.

2.1.8 Publicity, Marketing, and User Education/Training Methods. The NAWDEX Program Manager characterized their activities at the start of NAWDEX as working "like a used car salesman." They attempted to advertise NAWDEX to anyone who would listen. Responses to inquiries resulted in a brochure being sent with encouragement to become a member of NAWDEX. Senior staff members attended and spoke at many technical conferences or technical society meetings. They placed stories regarding NAWDEX in newsletters and encouraged members to include information regarding NAWDEX in their publications. The expansion of the system to include WATSTORE and STORET improved NAWDEX's marketability. The creation of an assistance center network and a working relationship with several state agencies have aided the saleability of NAWDEX.

The user conferences also have been very successful. The conference presents the program people and membership with an excellent opportunity to exchange ideas and plans. The program manager has used the information received at these conferences as input into his annual program plans.

As mentioned earlier, NAWDEX publishes a newsletter which is used to disseminate a great deal of information to the user. This has proved to be an excellent method of keeping the membership aware of what is going on in the NAWDEX system. Copies of the newsletter are also excellent for publicizing or marketing the system.

Periodic training sessions are held on topics such as the NAWDEX Data System or the NAWDEX Assistance Center. In addition, there is a continual updating of and search for information products that will be helpful to the membership (users) and improve the responsiveness of NAWDEX.

2.1.9 Performance Measures. There is no formal measure of NAWDEX's performance. Items that are looked at as measures of performance include growth of the program, number of new members, use of the program, and statistics on the number of requests through the assistance centers, central office, and/or number of direct accesses to the system. A new accounting system has been introduced so that NAWDEX can now keep track of the number of repeat customers. Another measure is the lack of complaints. There are few complaints and most of them result from people who do not understand the magnitude of their request. NAWDEX has received very little feedback from their assistance centers. They do not have control over staff assignments; therefore, there has been an inconsistency in the service supplied by the centers.

There is strong feeling by NAWDEX that a major contribution to its success has been the ability for users to get access to the data in WATSTORE and STORET as part of the NAWDEX system. This expanded the initial concept of a cataloging and indexing system but provided users with access to a great deal of information. An example of the expansion of the NAWDEX file is that in 1976, water data were available for 60,000 stations. In six years, data for 380,000 stations are available and soon, they will be adding data for an additional 450,000 wells.

2.1.10 Benefits of Network Participants. The most important benefit to members is the availability of a national system for cataloging and indexing water data. There is an organization dedicated to maintaining and improving the system resulting in quick and reliable access to water data. There is a

system to keep members aware of changes, improvements, new members, new data holdings, and systems improvements. There is no basic charge for belonging to the system, and minimum costs for data acquisition.

2.2 NLM - RML NETWORK/MEDLINE

2.2.1 General. The bibliographic and document delivery services provided by the National Library of Medicine (NLM) offer a rich resource of experience in several areas that are relevant to NEDRES management questions. For example, in the area of fee charges for document delivery, the practices imposed on the system have ranged from no fee to fees charged for certain specified items to fees charged for transactions across geographic boundaries and to blanket fees in some jurisdictions.

Another area of concern deals with access to data as opposed to access to documents. The management problems associated with the Laboratory Animal Data Base (LADB) offer some useful insights into such issues as the maintenance of data quality and integrity. Finally, in the matter of confederation governance, the RML Network experience should be most useful in evaluating such options as the provision of different classes of membership in a consortium. Alternative methods of attracting new participants and providing training for those who do join have been tested in the field by staff personnel of the regional medical libraries. For example, several regions have implemented the "circuit rider" mode of offering instruction to geographically scattered participants.

Because the RML Network and the MEDLINE Service are separately administered within NLM (i.e., they do not comprise an integrated system) and because the RML Network is more comparable to the NEDRES, the discussion that follows will focus mainly on the specific features of the RML Network. However, the discussion will also cover some salient lessons from the MEDLINE experiences on a selective basis.

2.2.2 Structure and Governance. The RML Network structure is basically hierarchical. In the current governance arrangement, the National Library of Medicine sits at the apex in the dual role of system manager and prominent

source of documentary materials. The second tier in the hierarchy is composed of the regional medical libraries. The third tier contains over 60 resource libraries--five to six per region, on the average. The final tier is occupied by several thousand so-called Service Units. Service Units are facilities such as libraries in hospitals and clinics, libraries in colleges and universities that have biomedical curricula, and even libraries in commercial organizations that are engaged in biomedical research or laboratory services.

On the surface, this structure looks simple and free of major faults. However, such is not the case. For example, the RML Network was first put together by means of grant agreements between NLM and the ten regional libraries. It was assumed, in effect, that the total operation would be self-governing. It was only after almost 5 years had passed, in 1970 to be specific, that the arrangements became contractual and the National Library of Medicine began to take on some direct managerial responsibilities. By that time, a sense of relative autonomy on the part of the local managers at the Regional Medical Library level had already become entrenched. The ambiguity of relative status was underlined by the fact that NLM acted in some ways as a peer and in some ways as a superordinate organization via the other regional libraries.

At present, a major restructuring is taking place. The number of regions will be reduced from 11 to 7. It appears that one objective of this restructuring is to enhance the managerial influence of the NLM but the outcome remains speculative because, historically, NLM has not been able to allocate adequate in-house resources to carry out more than a small, symbolic fraction of the network's managerial responsibilities.

2.2.3 Communication Patterns and Methods. The pattern of communication has generally followed the hierarchical structure in the sense that NLM has been the nexus for both the initiation and reception of communiques on all aspects of operation of the Network. One exception has been participant training and indoctrination. As suggested above, the training procedures have varied from region to region and many of the content and format decisions for training messages have been made at the regional level.

Recently, there has been an increase in the flow of messages at the lower levels, particularly between Service Units. This trend is generally considered to be a healthy one reflecting to some degree a fulfillment of the original concept whereby it was postulated that the Network could function well without obtrusive controls from above.

The main method of communication was and remains that of the transmission of memoranda. These memos are sometimes disguised as personal letters. In any case, whether the vehicle is a letter, memo, phone call, or a face-to-face conference, the mode is what might be called "basic bureaucratic."

From time to time, the Director of NLM has attempted to help the system break out of this mode by instigating "informal" conferences of relatively small groups of participants. The consensus of the staff is that these breakout attempts have not been very successful.

2.2.4 Legal or Operating Agreements. As noted above, the original legal base for the RML Network was a series of grants from NLM to the 10 Regional Medical Libraries. It is understood that at least in some cases, subcontractural arrangements were made between the RMLs and the Resource Libraries (RL). No explicit legal obligations were or are imposed on the Service Units as far as is known.

Under the present contractual set-up as compared to the former grant-based arrangement, the RMLs are more constrained to agree to a more precisely defined set of tasks. However, reallocation of resources and redefinition of the tasks by the contractor appear to be commonplace adaptations.

2.2.5 Policies and Methods of Financial Support. Under both grant and contract arrangements, the primary channel of funds transfer has been from the NLM to the RML. The rationale appears to have been something like this: "You (RML) are already engaged in providing some interlibrary loan (ILL) services to other, mostly less well endowed, institutions in your geographic area. We will award you funds as a form of subsidy so that you can greatly expand such activities to other institutions without impairing the quality of the services you provide to your primary constituency."

As in other RML Network features, what appears on the surface to be reasonable and straightforward turns out in practice to be far more complex. What seems to have complicated matters in regard to the RML Network fiscal arrangements has been the concept of the "reimbursable transaction." In a sense, ultimate accountability has rested on the notion of reimbursability--e.g., for making and mailing a photocopy of an article from a particular journal to a particular user. The problem centers on the definition of what is and is not reimbursable. The criteria have changed frequently over time and have never achieved complete clarity.

2.2.6 User Charges and Cost Recovery. In the beginning stages of the RML Network operation in the mid-1960s, little attention was paid to cost recovery. The Medical Library Assistance Act (MLAA) was clear in directing the NLM to encourage the broad dissemination of biomedical information and to ensure that worthy recipients were not denied access because of geography or institutional status. The phenomenal growth in demand for documents (partly attributable to the success of MEDLINE) was not anticipated, and funding under MLAA could not keep pace. User charges were selectively imposed in the late 1970s. In effect, the RMLs and the Resource Libraries were told that while their subsidies would continue, they could not expect these subsidies to keep pace with actual costs. Differences were to be made up by imposing user fees on their own extra-institutional clients. With some constraints (i.e., a recommended upper limit on the fee per transaction), the RMLs and RLs were expected to develop their own fee schedules and collection procedures.

Full cost recovery is still not a factor in the MLAA concept. Fees have been a byproduct of the inability to expand subventions as fast as demand has increased.

2.2.7 Operating Procedures. Basic document delivery operations follow the main conventions with standard ILL procedures. In effect, the Service Unit requests items for its patrons when such items are not locally held. The request is submitted to the nearest prospective holder. It moves up the chain of larger and larger facilities until someone can fill the request. Materials are mailed or otherwise transported directly from the agency that fills the

request to the Service Unit. Books are sent as loans from one library to another. Journal articles are sent in the form of photocopies so that no return is needed. Photocopies make up the main bulk of traffic and it is for these transactions that fees are usually levied. Whether the Service Unit Library passes the charge on to the end-user is up to the Service Unit management.

2.2.8 Publicity and User Training. As indicated above, promotion and training has been a specific contractual obligation of each RML. Each seems to have taken a somewhat different tack--depending in part on historical affiliations between the RML and its neighboring Service Units and in part on the general sophistication of the staff personnel at the Service Unit level.

One highly consistent procedure and, as such, possibly the backbone of this function in all regions, has been the use of a periodic newsletter. Such a vehicle most often contains not only news (e.g., descriptions of recent additions to the MEDLINE files) and notices of seminars, symposia, etc., but also what might be called mini-lessons: specific step-by-step instructions in how to obtain a given service from a Resource Library, an RML, or from the NLM.

2.2.9 Performance Measures. In a gross sense, the level of demand traffic could be taken as a basic performance indicator. If so, the RML Network operations as a whole would be validly considered successful. If, however, the approach taken is more particularistic--in the sense of specific impacts on the quality of health care or in the sense of comparing the performance of one RML against the others--the picture is murky at best. Flatly, no impact studies have been done. In the matter of RML management, the approach has been narrrowly bureaucratic. For example, in the early 1970s a program audit was conducted on a national scope by a "blue-ribbon" panel. The process was similar to the ritual of accreditation in academic institutions. The bottom line was in the form of a qualitative assessment based on the audit team members' subjective opinions so that the recommendations for improvement were generally soft and arguable.

Otherwise, some spot reviews have been conducted in the manner of a management-by-exception approach. That is, when enough symptoms of a malfunction appear to top-level NLM officials, a site-visit team is mobilized to make specific inquiries. The main consequence of this approach is some chronic tension between the RML staff and the NLM staff.

In the mid-1970s, attempts were made to implement some form of continuous process monitoring system. Some pilot tests were conducted but, in effect, the RML Directors blocked the implementation of that innovation.

Still more recently, a total system evaluation was launched by contract with ABT Associates. A specific performance measurement scheme was called for in the RFP but the resultant instrumentalities, if developed, have never been made public. The evaluation contract itself was terminated prior to the completion of the main data collection effort.

2.2.10 Benefits of Network Participation. The crucial incentive for participation in the RML Network was and is economic, in the sense that participants are virtually guaranteed access to all the world's literature in the biomedical area without being required to purchase more than a minor fraction thereof. Many of the senior staff at NLM who have been active in the project believe that the impact on the Service Unit libraries has been irreversibly beneficial. The local service providers have become more capable in all facets of their work as a consequence of network involvement. Indeed, they claim that local collection development has been amplified by participation because local providers have been sensitized to their user's needs and have justified expansion of local collections on the basis of the increased demand traffic. Local demand has shown them what they should acquire in order to avoid the delays in service inherent in the ILL-type transactions via the network.

2.3 Social Science Data Archives Network

2.3.1 General. Back in the mid-1960s, the component of the community of social scientists that was concerned with mass phenomena (e.g., voting behavior, family budget decisions) confronted a situation very similar to that

which now confronts the community of users of environmental data. First, it was conceptually clear that data were being collected that were relevant to more than one inquiry but were not known to exist or were inaccessible to secondary users. Second, it was apparent even at that time that computer technology provided a possible means of not only facilitating awareness and access but also for actually making the data "suitable" for secondary use.

At this time, some limited forms of confederation had already been established. A classic case in point is provided by the Roper Public Opinion Research Center--originally sited at Williams College, Massachusetts--and its formation of the International Survey Library Association in 1964. There were quickly 93 member organizations, mainly data-file producers--22 domestic and 71 non-U.S.

Another major precursor confederation was the Inter-University Consortium for Political Research that was founded in 1962 by the administrators of the Institute for Social Research (Survey Research Center) at the University of Michigan in 1962. Other centers at the University of California, Berkeley; Yale; Wisconsin; the University of Cologne, Germany; and the Steinmetz Institute at the University of Amsterdam were moving in the same direction. Through local, regional, or subject-based confederations, they were attempting to make data available to secondary users (such as social science faculty people in smaller institutions) who could not bear the cost of primary data collection.

At this time (1967), the Council of Social Science Data Archives (CSSDA) began to make its presence felt. The spade work had begun in 1962 by an ad hoc committee of recognized leaders in "quantitative social science." The role of CSSDA, which was to be housed at the Bureau for Applied Social Research at Columbia University was--"planning, policy-making, and information dissemination--for coordinating and publicizing the activities of a confederation of social science data archives. Its basic principles (were) that machine-readable data and supporting documentation useful to the social science community should be readily accessible, at minimum cost, to scholars and be rediffusible to archives and individuals."

The advent of this confederation of confederations was greeted by great enthusiasm. However, for present purposes, its most interesting characteristic was that it failed. The exploration of the causes of that failure--which are not now documented--should provide valuable lessons for NEDRES.

2.3.2 Structure and Governance. The governance of CSSDA could be characterized as academic. A small resident secretariat was formed under the leadership of an Executive Director (Dr. Wm. A. Glaser). He was supported by a non-resident Executive Committee (made up predominantly of the original eight founders), a Technical Committee, and three standing technical subcommittees (information retrieval, computer development, and standards).

Twenty existing organizations (archival centers) such as those at Williams College; the Universities of Michigan, Wisconsin, and California at Berkeley; and the several European centers comprised the rank and file membership.

The nominal mechanism was that the Executive Director would propose (plans, etc.) and the Executive Committee, meeting twice yearly, would discuss and decide on policies and procedures.

2.3.3 Communication Pattern and Methods. Again, the academic model is preeminent. The main formal device for interparticipant communication was the annual technical conference. Such conferences generate proceedings documents. In one case, the proceedings were published in serial form by the journal, Social Science Information. Ad hoc communiques for the Director's Office were distributed as memoranda but the journal was perceived as the crucial vehicle for substantive messages of any weight.

It should be reemphasized that we are looking at a confederation of confederations. It could be accurately characterized as being somewhat elitist in nature, not too interested in extensive transactions with lowly end-users. Such transactions appear to have been left to the subordinate confederations. These "first-line" organizations typically did (and still do) provide their constituencies with newsletters, workshops, symposia, etc., so these forms of communication were not neglected in the framework of the total system.

2.3.4 Legal or Operating Agreements. All of the component organizations within the Council were subdivisions of academic institutions and, as such, had the legal status of not-for-profit corporate entities. So did the Council itself as a nominal creature of Columbia University's Bureau of Social Research.

In effect, the member organizations, all of which had previously established transactional arrangements with regional constituencies of data providers and (mainly) users, delegated on a good-faith basis the role of standards development to the Council. Two points must be emphasized: (a) it was perceived that any tangible inter-center cooperation was highly dependent on the creation of such standards, and (b) a super-ordinate entity was needed if a universal index of holdings was to be created--no individual center could exert neither the energy nor the coercive influence to bring a comprehensive catalog of holdings together in one file. It should also be remembered that the spirit of the times was one of ebullient volunteerism--fueled by a relatively substantial flow of federal funding for large-scale social science research. Thus, rather than a tight legalistic arrangement, the enterprise was relatively informal. Only the minutes (including semi-formal "resolutions") of the Executive Committee could be regarded as analogous to a legal charter. In law, such a set of documents might constitute an implicit contract. It is clear that the member organizations acted as if it were such --at least for a few years.

2.3.5 Policies and Methods of Financial Support. In the first instance, direct costs were carried by the Bureau for Applied Social Research. In 1966, the National Science Foundation provided a substantial subsidy but the exact amount is not known at this time. Some discretionary funds were available from the member organizations through money flow from their member/users who paid both annual subscription fees and specific use fees. There is no record of the main members paying dues to the CSSDA directly.

It is inferred from the documentary descriptions that the nominal overheads of the central secretariat would continue to be provided by Columbia as a normal good-will gesture in support of research progress in general. Again, such financial arrangements were fairly commonplace at the time. The

central secretariat for Biological Abstracts, it should be recalled, was quietly subsidized by the University of Pennsylvania for several years until user subscription fees began to flow in sufficient quantity. In short, such "bootleg" arrangements on the part of universities were normal and taken for granted by the involvees.

2.3.6 User Charges and Cost Recovery. On the evidence available, CSSDA did not, itself, levy user charges. Cost recovery came from the NSF grant (and presumably from indirect use charges and by some skimming from other grants in effect at the Bureau and the member centers).

Cost recovery by the member centers was, however, more complex and it varied from center to center. For example, the Roper Center was the benificiary of a subvention from the Roper organization in both "cash and kind". The latter was in the form of the data files from the Roper surveys once their commercial value had been extracted.

Membership fees for the International Survey Library Association, which was a spawn of the Roper Center, were $1,000 at entry and $500 per year back in the mid-1960s. Over and above such "dues", these members still paid a fee at cost for each file they received. Non-members paid direct costs plus an overhead charge.

Most of the other centers had what amounts to a sliding-scale arrangement with users. The more editing, cleaning, etc., that the user was willing to do, the lower the cost to the center and the lower the fee to the user. Still others imposed a flat fee because their internal mode of operation was to pre-process all files themselves, thus imposing rather high fixed costs on themselves that were then passed on to users.

2.3.7 Operating Procedures. The main products of the CSSDA were standards, codebooks, and documentation of utilization procedures. A comprehensive catalog, appropriately indexed, is mentioned as a goal but no indication is available to show that this tool was ever completed. As mentioned above, this tool would have been the main instrument by means of which the actual exchange of holdings between participants would have been managed.

The procedures at the individual centers were, again, varied. Three main modes have been described. The first alternative is designated in the literature as the pure consortium arrangement. This arrangement is characterized by a highly trained staff that routinely conducts pre-processing. A consequence of note is a tendency for centers adopting this mode to concentrate on dealing with data files that are already in near-usable state and that have a high probability of being attractive to secondary users.

The second mode is more of a do-it-yourself arrangement. The argument for this mode is that it is really not possible to predict in advance which files will be attractive or what purposes users will want to put them to. This mode, however, requires a capability for relatively quick turnaround on the editing function. The MIT Center epitomizes this mode and has developed specific automated aids that do permit rapid file editing.

The third alternative is a hybrid. It involves mainly the provision of a more varied "kit" for the user: more hands-on support by center staff for users but the user still controls the data preparation process and actually does most of it.

2.3.8 Publicity and User Training. The standards, codebooks, and procedures described above constitute the raw materials for user training. It is a reasonable speculation that publicity and the actual employment of such materials for training end-users was left in the hands of member centers. Most of the centers enjoy a good reputation for the fulfillment of the user training responsibility. For example, the center at the University of Michigan reliably provided an annual series of workshops and tutorials for secondary users at nominal cost. Again, it must be emphasized that the context was one where a spirit of noblese oblige prevailed. The senior social science research staff at Michigan perceived themselves to be among the anointed leaders in the field with an obligation to assist those colleagues who by virtue of their affiliation with lesser institutions were in need of help if they were to make their maximum contribution to the progress in the social science discipline.

2.3.9 Performance Measures. No formal or informal evaluation procedures are mentioned in available descriptions of the operation of the Council. One presumes that the subjective judgments of the chief people in the member centers were the main sources of performance feedback. The centers were judged--and judged themselves--on the quantity and quality of the scholarly publications that grew out of work with the data files.

2.3.10 Benefits of Network Participation. Social science data files are notoriously poorly documented and "dirty." These deficiencies were and are susceptible to amelioration if original data gatherers could be persuaded to adhere to consensual standards. The weight of prestige from a body such as CSSDA could have been influential in getting such standards accepted and implemented on a world-wide basis.

Even more to the point, the participants apparently recognized the potential value of a referral type service. Unfortunately, it appears that the basic tool for such a service--i.e., a catalog--was never produced.

2.4 The On Line Computer Library (OCLC, Inc.)

2.4.1 General. Many commentators have expressed themselves along the lines that OCLC was the most important phenomenon of the 1970s in the field of library operations and information services. They see OCLC as a model for--and major component of--the global information network of the future.

Ironically, OCLC was never intended to become what it has become. The original objective was entirely mundane and even provincial. It was to create a computer-based union catalog of the library holdings of 47 institutions of higher education in the state of Ohio. As such, it was originally the creature of a predecessor academic consortium, the Ohio College Association. From 1951 to 1967 (which is OCLC's incorporation date), some level of planning was continuously underway in an attempt to achieve improved methods for the sharing of library materials among the member institutions of OAC. By 1967, the consensus of the academic planners, member librarians, and technical consultants was that a computer-based union catalog was achievable with the then-available technology plus the fiscal resources of the members.

What was not seen clearly, in advance, was that the standardized file entry format for each catalog record would permit all participants to benefit, in the form of reduced work load, from any original cataloging--done by any member library--that was entered into the file. It became apparent only after the fact that the basic entry made by one member could be used and modified by any other member without degrading the initial, basic entry. In other words, one member could use any part of any other member's contribution but would not be coerced into adhering to the initial interpretation or conforming to another library's local practices.

At about this time, the cataloging work of the Library of Congress began to become available to libraries in a computer-readable version by means of the MARC-II tapes. Thus, in order to save still more work, the membership group could acquire the MARC II file each month and give themselves at one stroke a nucleus of completed cataloging workups from a highly authoritative source. Given a local computer program that could drive a card production operation, OCLC accomplished a major centralization and a burden-sharing capability without much loss of local autonomy and without really having intended to do so.

It is also somewhat ironic that the initial goal of facilitating the movement of materials via computerized request transfer was not fully realized until 1979. Meanwhile, the cooperative undertaking had transcended state and national boundaries to bring the labor-saving capability to over 2,000 member libraries.

2.4.2 Structure and Governance. In some ways, OCLC has some features in common with all three of the basic types of network structure: distributed, star, and hierarchical. The distributed type structure is a pure network in a technical (engineering/mathematical) sense because all nodes are concurrently accessible by all other nodes. OCLC contains this feature in the sense that any message (record) entered by any participant is accessible in real-time by any other participant. OCLC also has attributes of a star-type network because of the centrality of both management and data processing facilities. Finally, OCLC is hierarchical in that the system has now adopted a "regional"

approach so that its clientele is comprised primarily of subnetworks. There are only about 20 such subnetworks but the total system serves over 2,000 individual libraries.

The governance arrangements for OCLC have evolved in a striking manner over its 15-year history. In the beginning, the governance mode could be characterized as quasi-academic and elitist. The original Board of Trustees was comprized exclusively of librarians and academics from the larger or most prestigious of the charter membership group. In any case, there is a strong sense among involvees that deliberations during the first ten years of operation were dominated by a single personality--Dr. Kilgore. In 1977-1978, due to part to agitation by the Directors of the affiliated networks, the governance body was opened up. The Board now is composed of 15 persons, six of whom are selected by the Users Council which itself is the mass of the participating libraries. Since some Directors of affiliated networks are included in the remaining nine members, it is asserted by OCLC officials that OCLC is "governed by its membership."

Others would assert that the real governance mode is essentially entrepreneurial in the sense that OCLC provides a service by contract for a price and participants can "buy in" or "opt out" on the basis of their perceptions of value received. Membership influence on policies and practices is dilute at best if there are six trustees for 2,000 member libraries. Also, recent discussions suggest that the Users Council is not a very coherent body.

2.4.3 Communication Patterns and Methods. The principal device for communication from "headquarters" to the 2,000 member libraries is by newsletter. Otherwise, inter-member communication is via the computer and is highly constrained in format.

Much of the awareness on the part of local library managers and practitioners of "problems" appears to be by word-of-mouth diffusion. If this mode appears to be inadequate, it is possible that a major reform is underway in the form of the recent advent of the Council for Computerized Library Networks. This body is independent of OCLC but will provide a unique forum for the exchange of views among OCLC members (and others, as well).

2.4.4 Legal and Operating Agreement. OCLC was chartered as a non-profit corporation in Ohio in 1967. That legal status has not changed although the charter has been modified and the name has been changed.

One of the important legal aspects of OCLC's operation is represented by the role of the so-called interstate compacts. Such compacts permit regional collaboration across state boundaries on the part of governmental and quasi-governmental agencies. Thus, ad hoc cooperative agreements between state supported institutions such as colleges or between local government supported institutions such as 2-year colleges and public libraries are enabled by such interstate compacts. NELINET, one of the larger of the OCLC affiliated networks, is an example of a compact supported consortium. It is doubtful whether OCLC could have expanded as rapidly as it did had not these interstate arrangements already been in place.

Finally, the lynch-pin legal aspect is the service contract. In the first instance a contract-type agreement is set up between OCLC and the affiliated network. In the second instance, a Participation Agreement is executed between the individual library and the affiliated network. In a sense, the affiliated network organization becomes the agent of OCLC through this two-stage arrangement.

2.4.5 Policies and Methods of Financial Support. The key element of financial support for OCLC in its original form was a provision for pro-rata dues from the charter member libraries. During the first three years, 1967-1970, such dues were virtually the only funds available. Starting in 1970, when off-line catalog card production commenced, a unit service fee was levied on top of the dues. That is, members were charged for each card they received.

In 1973, another form of unit charge was introduced: the so-called "first-time use" fee (FTU) which will be discussed in detail below.

During the critical formative period (specially from 1970-1972), the organization received substantial support from grants made by the (then) U.S. Office of Education (USOE) and the Council on Library Resources (a Ford Foundation entity). These funds covered a crucial need: capital equipment

acquisition and the costs of augmenting the computer programs to handle additional loads and additional functions. (Ironically, the first grant application made to the USOE was rejected because the project was seen to be "too parochial.")

2.4.6 User Charges and Cost Recovery. In its status as a non-profit corporation and an offspring of an academic consortium, OCLC always suffered severe constraints on its ability to raise capital for service expansion and development. However, the recovery of day-to-day operating costs were always handled in a well precedented, straightforward way. That is, an operating budget was prepared and the member organizations "chipped-in" to cover costs in rough proportion to ability to pay and/or benefits received. In the case of OCLC, both ability and benefits were seen to be positively correlated to the size of the member's library collection, so that criterion was used to determine the proportionate contribution of each member. These contributions were designated as annual dues.

Once services were underway, the cost-benefit relationship for each member (i.e., the equity of the contribution) could be made more accurate by the imposition of unit service charges. Thus, per card charges and FTU charges were imposed. (Note: Telecommunications and terminal acquisition costs were always handled locally by individual members or by the regional affiliated network.)

FTU charges are now the principal source of revenue for OCLC (over 60 percent). When a user calls up a particular record for the first time and it is not one that the user put into the file, a tally is rung up at the central computer. Once that tally is made, the user can return to the record in question as many times as necessary without incurring additional fee charges. Since each call-up involves a direct benefit for the user, the FTU charge works two ways: it distributes costs equitably among users in the sense that those who benefit most pay more; and, it encourages broad use--e.g., for both pre-acquisition information (who holds) and pre-cataloging information. The broader the use, the more benefits the user gets for the fee.

FTU charges not only permit OCLC to recover costs but generate a surplus that can be distributed to members in the form of fee rate reductions in future fiscal periods or that can be used by OCLC to improve services.

2.4.7 Operating Procedures. The operating procedures center around specific entry location in an ever-growing file. Fifty to sixty percent of the entries came from the MARC II tapes, the rest come from the members themselves. The access code is based on the first three letters of the author's last name and the first four letters of the title.

This code pulls one or more entries which are displayed on a cathode ray tube. Data can be copied from the display (e.g., for verification of a bibliographic description), or additions can be made to the basic entry to reflect local cataloging practices, or a message can be sent to OCLC to generate a tailored card set using the record entry.

New procedures have been added since 1979. In the intervening period, some degree of material exchange was indeed facilitated by the availability of even a partial union catalog in a computer-readable form. Now, request for materials can be transmitted via the computer link. In addition, provisions are being made to handle serials and non-print materials in the near future.

2.4.8 Publicity and User Training. As might be expected for a system that grew out of a completely academic organization, the basic publicity was through two channels: word of mouth supported by the "invisible college" of academic librarians, and by articles published in the professional journals. An example is provided by the instance of the formation of the PALINET, one of the early-joining affiliated networks. The prologue, a demonstration at OCLC for four directors of major Pennsylvania academic libraries, was arranged by Richard DeGenaro, Director of the University of Pennsylvania Libraries.

The advent of PALINET also illustrates how user training was accomplished. Each member of PALINET installed a terminal that was linked to the OCLC computer in what was called a "guest mode." This arrangement permitted staff practice in a relatively leisurely manner. Such practice was augmented by an operations manual supplied by OCLC. After a "guest mode" month and another month of practice in fee-paying mode, an OCLC representative came in

for a one-day question-and-answer session with the user's staff. In brief, OCLC training might be characterized as highly decentralized and empirical.

2.4.9 Performance Measures. No broad-based evaluation study of OCLC has ever been conducted. However, several measures have come to the fore in what might be called spontaneous consumer reactions. One such measure is cost savings. Various estimates have been asserted by member libraries but the consensus of the moment hovers in the range of a 30-percent reduction in the basic cost of cataloging new acquisitions.

A second spontaneous indicator or measure is the quality of the cataloging contributions of the various members. Again, on the basis of an informal consensus, the word is that quality has deteriorated as the membership has grown. There is one instance wherein an affiliated network has withdrawn and shifted its "business" to a rival (i.e., BALLOTS), allegedly because of disappointment with the input quality.

Other measures that are potentially usable are now reported on an impressionistic basis and include such factors as reduction in time and errors in validating bibliographic information used in ordering books from suppliers, validating interlibrary loan (ILL) requests, and selecting libraries to which ILL requests will be directed.

One could protest that the essential performance measure is user satisfaction and that such a measure is operationally defined as the number of participants. On such grounds, OCLC would be deemed to be highly successful.

2.4.10 Benefits of Network Participation. The best short answer to the implied question is that participants benefit from OCLC by having their work load reduced without being required to pay too high a price in either money or local autonomy. In addition, there is a growing benefit in the form of quicker, more reliable document deliveries in response to ILL requests.

2.5 GEOSCAN - The Canadian National Database for Geological Information

2.5.1 General. GEOSCAN (previously named Canadian Index to Geoscience Data) is a bibliograhic database controlling Canadian-produced and/or Canada-related

geoscience documents. GEOSCAN is managed by the National GEOSCAN Centre, Geological Survey of Canada (GSC). There are ten participating agencies (provincial and national) cooperating in the system through the indexing of contributed records. No records are indexed by the National GEOSCAN Centre. The GEOSCAN database covers both published and unpublished geoscience documents ranging from 1845 to date.

2.5.2 Structure and Governance. A small central office, the National GEOSCAN Centre located in Ottawa, Canada, is responsible for the overall management of the GEOSCAN database. GEOSCAN is a cooperative system and the relationship between the Centre and the participating agencies is strictly advisory.

Membership in the group is limited to the ten participating agencies. Access to GEOSCAN is available to the general public in the form of computer searches through the Library of the Geological Survey of Canada. The participating agencies also are able to retrieve data directly from the database.

Recently, the GSC set up a geological management committee composed of the head of GSC and his counterparts in the Provincial Geological Surveys. This group has set up a management committee to advise the GEOSCAN Centre on GEOSCAN. The plans are for this group to meet three times a year. They will discuss general network problems such as indexing, cost sharing, operating agreements, and performance measures.

2.5.3 Communication Patterns/Methods. The GEOSCAN Centre is responsible for communicating with the ten participants covering the content and operation of the network. They do have a newsletter and have set up an electronic mail system with their participants. In addition, the Centre schedules an annual meeting of users.

2.5.4 Legal or Operating Agreements. There are no legal agreements or memoranda of understanding associated with GEOSCAN. They have considered them and will use the new GEOSCAN management committee to possibly implement a legal agreement in the future.

2.5.5 Policies and Methods Regarding Financial Support. The National GEOSCAN Centre receives a budget to run, maintain, and improve the GEOSCAN database. This staff consists of only three people. The GEOSCAN budget is paying for the purchase of new software and all operational costs including the cost of use by the ten cooperating agencies (providers of data). A request has been made in their budget for additional funding of the project.

2.5.6 User Charges and Cost Recovery. There are two types of users of the system, the cooperating agencies and those outside these agencies. The cooperating agencies, as providers of the data in the database, use the system at no cost to the agency. The entire cost is carried by GEOSCAN. Other users must request a search for data through the GSC Library where they are charged exactly the cost incurred by the computer search. A minimum charge of $10 per search topic is made. These charges do not represent full cost recovery. Excluded from charges are items such as staff time, mailing materials, and computer or Centre surcharges.

Technically there is a third category of user. It is possible for a user to request a search through one of the cooperating agencies. If this occurs, it is not clear whether or not the cooperating agency charges their client for the search of GEOSCAN. This situation/relationship will be clarified in the future.

The GEOSCAN Director feels there will be a cost sharing relationship in the future. Again, the management advisory committee will consider this problem.

2.5.7 Operating Procedures. The GEOSCAN Centre has produced a set of three documents needed for users of the system. The set consists of:

- A manual dealing with the computer aspects of the system such as logging-on procedures.
- A manual used by the indexer which contains the approved terms for the file.
- An Indexing Manual which indicates the correct terms to be used for different situations.

Information or assistance regarding the operation of the system is available to potential users through the National GEOSCAN Centre.

2.5.8 Publicity, Marketing, and User Education/Training Methods. The Director of the National GEOSCAN Centre does not feel they have been in a position to advertise or maintain a publicity program for GEOSCAN. This conclusion is based on the cumbersome software for the current system which requires the writing of a separate program for each search. They can barely keep up with current demand for searches. GEOSCAN has recently purchased new software (MINISIS) and expects the system utilizing MINISIS to be operative within a year. This will alleviate the need for special programming and allow the system to become responsive to its users. At that time, GEOSCAN will market the database to professional organizations and the public, private, and academic sectors. They also plan to place the database with a commercial vendor.

The limited number of current users reduces the need for formal user education and training. Problems, however, are discussed with the cooperating agencies (i.e., indexing).

2.5.9 Performance Measures. There are no performance measures for the current system. The topic, however, was discussed at the first meeting of the GEOSCAN management advisory committee.

2.5.10 Benefits of Network Participants. The limited range of providers and users of the GEOSCAN database makes it difficult to list benefits for network participants. Perhaps the major benefit has been standardization. A good example is the unpublished mineral assessment file. The documents in this file are annual reports filed by individuals/companies who have land claims in Canada. The report indicates the work done on the claim during the year in order to justify maintaining the claim. Prior to their inclusion in GEOSCAN, the reports were submitted in a bizarre fashion. Obtaining information about the claims was difficult. This situation has changed with the indexing procedures of the system. GEOSCAN has also helped control unpublished literature, again giving a structure to the manner in which the information is indexed.

The basis for a viable national system for Canadian geoscience data is well in place with GEOSCAN. The shift to the new software should allow an expansion of data included in the database and increased opportunities and benefits for users.

2.6 Incidental Observations

One point that came out of the review of the AGRIS systems deserves to be recorded here. That is, when the AGRIS file was first completed, it was possible to conduct a rough statistical analysis of the intensity of coverage by topic on a global basis. When this was done, the pattern that emerged was compared to official priorities for agricultural development as articulated by the Food and Agriculture Organization of the UN. This exercise revealed some discrepancies which provided, in turn, a basis for some reallocation of investment in agricultural R&D to fill the gaps. Such gap identification could be also a natural byproduct of the creation of the NEDRES file.